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PATENT SPECIFICATION

NO DRAWINGS

1.173.143

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COMPLETE SPECIFICATION

Improvements in Protective Clothing

I, THE SECRETARY OF STATE FOR DEFENCE, London, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The manufacture and use of certain dangerous chemicals such as pesticides involves dealing with corrosive or toxic liquids in a particular form, e.g. sprays or mists, from which it is important to protect personnel. Although a reasonable degree of safety may be achieved by good design of manufacturing plant and by the issue of comprehensive safety instructions, it is highly desirable to equip personnel with clothing which will protect them against exposure due for example to a mistake in handling or to an unexpected plant failure.

Protective clothing made of a substantially completely impermeable material, such as plastics oilskin, can give good protection against liquid in contact therewith but can interfere to an incapacitating extent with the heat exchange of the wearer by preventing the egress through the impermeable clothing of heated air and perspiration-derived water vapour from the wearer.

The present invention provides clothing which protects the wearer against the inward passage firstly of externally applied offensive liquids and secondly of vapours therefrom while permitting the egress of heat and perspiration from the wearer; the clothing affords protection from all conditions except gross contamination or application of liquid with sufficient pressure to force some through.

Such protective clothing, according to the invention, comprises an air-permeable cloth treated with an oleophobic compound in combination with an inner lining of absorbent charcoal lying on the surface of the cloth towards the wearer; the outer surface thus has the liquid-repelling property and the charcoal

on the inside is a barrier to any vapour passing through.

The propositions of oleophobic liquid-repellent and of absorbent charcoal are insufficient to provide an appreciable barrier to egress of heat perspiration from the wearer but sufficient to provide an effective barrier to the passage through the material of corrosive or toxic chemicals which approach the liquid-repelling outer surface of the cloth (remote from the charcoal lining) as liquids in a particulate form.

Air-permeable cloth which may be used in carrying out the invention includes woven, non-woven, knitted and composite fabrics composed of natural or synthetic fibres, or combinations of these i.e., the cloth may be at least in part a non-woven cloth of synthetic fibres. Such fabrics should have a high permeability to air so that although processing will inevitably reduce the size of a proportion of interstices between the fibres composing the fabric, the final liquid-repellent treated material will still permit free passage of air. The preferred lower limit of air permeability through the fabric initially is about 150 linear feet per minute (i.e. 150 cu. ft. of air/sq. ft. of material/minute) under $\frac{1}{2}$ " water gauge pressure difference across the fabric, giving a typical permeability value for the final protective garment of about 100 linear feet per minute.

Commercially available fabrics having the required degree of air-permeability are generally non-woven fabrics formed by bonding together layers of consolidated fibres. The relative orientation of the fibres in the non-woven fabric may be closely controlled in manufacture to give the fabric a desired air-permeability and to give enhanced strength to the fabric in a chosen direction.

Synthetic fibres are generally stronger, weight for weight, than natural fibres and are consequently the preferred constituents of fibres used in the invention since maximum tear and abrasion resistance in the fabric is

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desirable to prevent rupture of the treated cloth.

Particularly suitable non-woven fabrics containing synthetic fibres comprise a major proportion of polyester or polyamide fibres e.g. nylon fibres together with a minor proportion of viscose fibre bonded with neoprene. A further layer of light weight woven or knitted fabric of natural or synthetic fibrous material e.g. light-weight cotton scrim, may be bonded to the fabric if desired in order to provide additional tear resistance.

The liquid-repelling compound by which the cloth is rendered liquid-repelling should repel both oils and water if the protective clothing material is to be effective against a wide range of possible liquid contaminants. Oleophobic liquid-repelling compounds which are also hydrophobic are well-known in the textile industry, and are generally characterised by having a fluorocarbon chain and an end-group capable of being attached to either natural or synthetic fibres by physical or chemical means.

The absorbent charcoal lining may be formed by an adhering coating of charcoal particles on the surface of the inside of the garment. Thus clothing according to the invention may be made from clothing material manufactured by the process according to the co-pending patent application No. 40059/65 (Serial No. 1173142).

The protective clothing may take various forms, for various purposes. Thus the invention can provide a complete garment for the protection of the whole person of the wearer, and in particular may be an overgarment to be worn over the ordinary clothing. Again, the clothing may be to protect only that part of the person which is in danger from toxic liquids and thus may be a hood to cover the head and neck only or may be in the form of protective gloves or mittens or may be the glove parts of a glove-box or fume cupboard.

The clothing may be resistant to burning — e.g. by being made of cloth made by the process according to claim 11 of the above-said co-pending application.

WHAT I CLAIM IS:—

1. Protective clothing for protecting the wearer against the inward passage firstly of externally applied offensive chemicals in particular liquid form, and secondly of vapour therefrom, while permitting egress of heat and perspiration from the wearer, comprising, in combination, an air-permeable-cloth treated with an oleophobic compound to render its exposed outer surface liquid-repellent, and an inner lining of absorbent-charcoal on the surface of the cloth towards the wearer.

2. Clothing according to Claim 1 having an air-permeability of at least 100 linear ft. per minute under a pressure of $\frac{1}{4}$ in. water gauge.

3. Clothing according to Claim 1 or 2 made from permeable cloth that is at least in part a non-woven cloth of synthetic fibres.

4. Clothing according to Claim 3 made from a non-woven layer of synthetic fibres to which is bonded a layer of highly permeable knitted or woven fabric.

5. Clothing according to Claim 3 from a non-woven cloth consisting of a major proportion of nylon fibres and a minor proportion of viscose fibres bonded with neoprene, to which is bonded a light-weight cotton scrim as reinforcement.

6. Clothing according to any preceding Claim of which the outer surface is both water-repellent and oil-repellent, by being treated with a fluorocarbon compound.

7. Clothing according to any preceding claim which is also resistant to burning.

8. Clothing according to Claim 1 or 2 made from clothing material manufactured by the process according to co-pending patent application No. 40059/65. (Serial No. 1173142)

9. Clothing according to any preceding claim which is a complete garment or overgarment for protecting the whole person of the wearer.

10. Clothing according to any of Claims 1 to 8 in the form of a part garment — e.g. hood, glove, or mitten — or of the glove portion of a glove-box or fume cupboard.

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